

Growing truffle in hazelnut orchard in Ontario:

A high potential area for native and european truffle cultivation.



ONTARIO TRUFFLES
GROWTH. UNDERNEATH...



Young Quebec hazelnut orchard producing truffle (photo: 2014) First truffle harvest (2017)

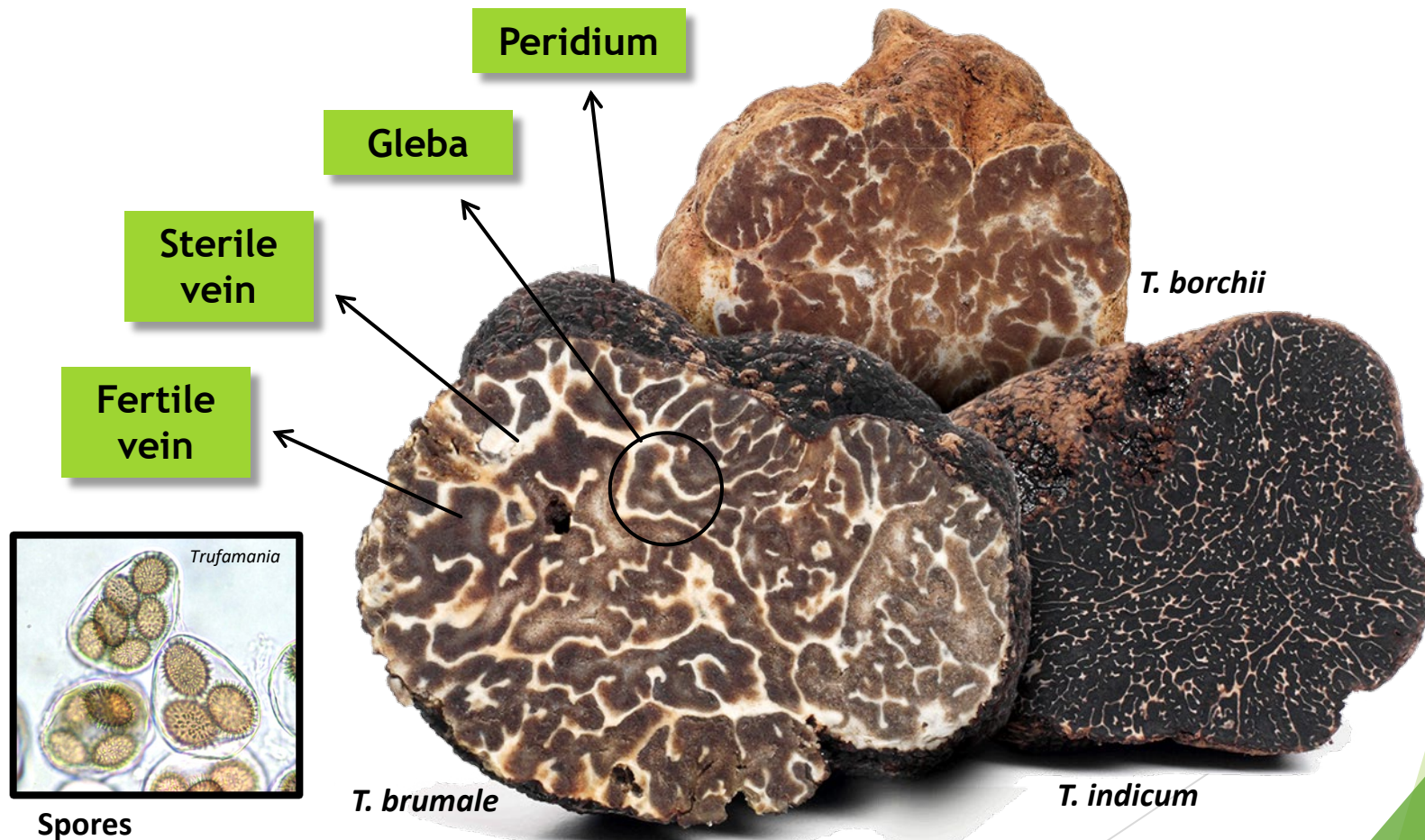
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10+ years of R&D
www.arborinnov.com
www.ontariotrufflesinc.com



Ontario Truffles Inc.

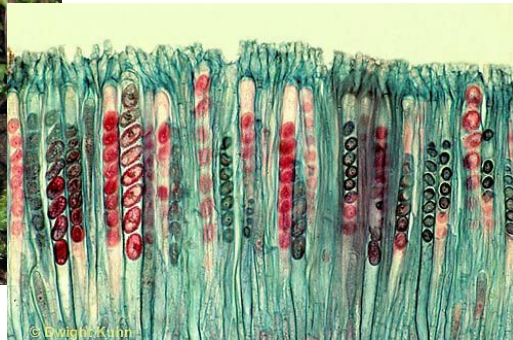
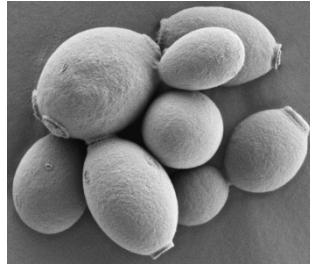
What is a truffle?

A fructification of an underground fungi of the genus *Tuber*.

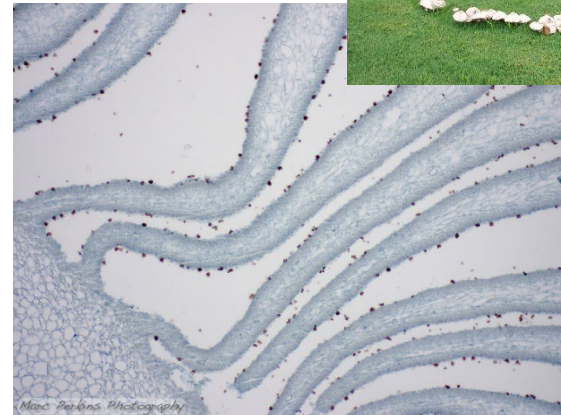


Fungi

Ascomycetes



Basidiomycetes

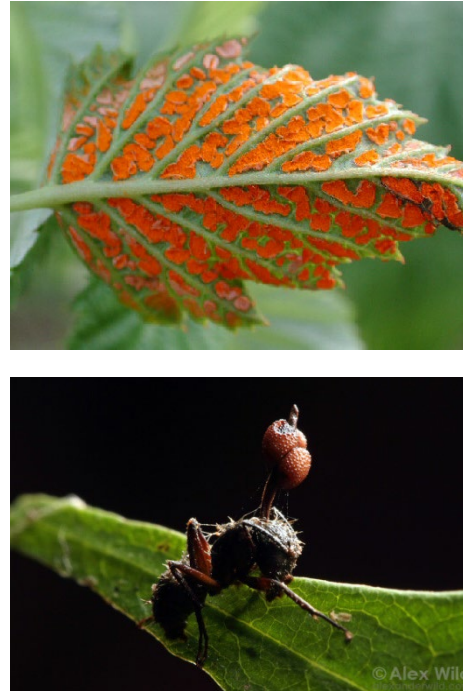


3 types of nutrition

Saprophytic



Parasitic

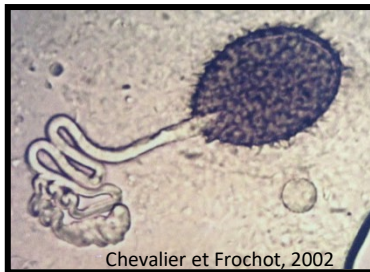
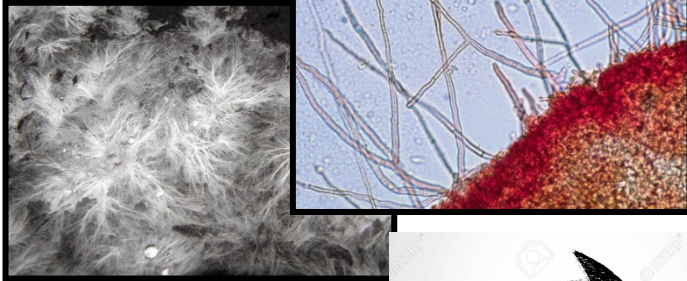


Symbiotic

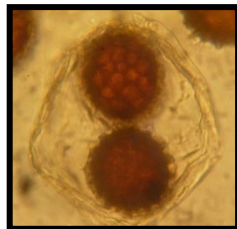


Tree – Truffle symbiosis

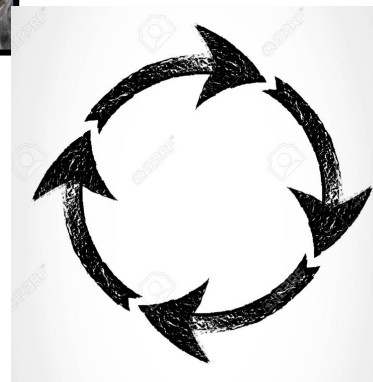
Mycelium



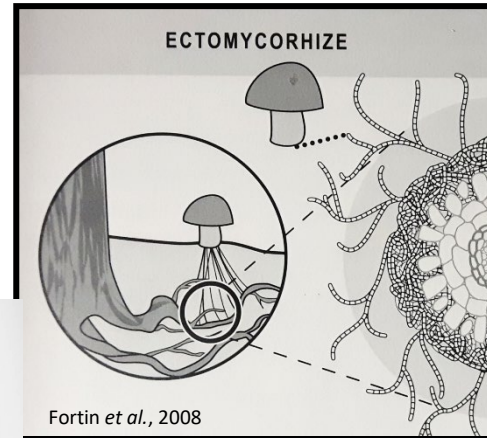
Spore germination



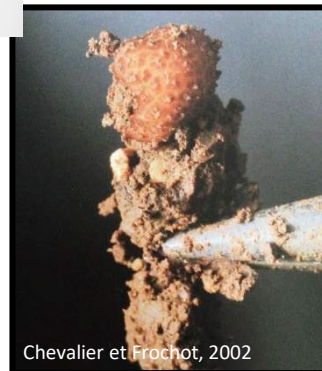
Spore release



Maturation



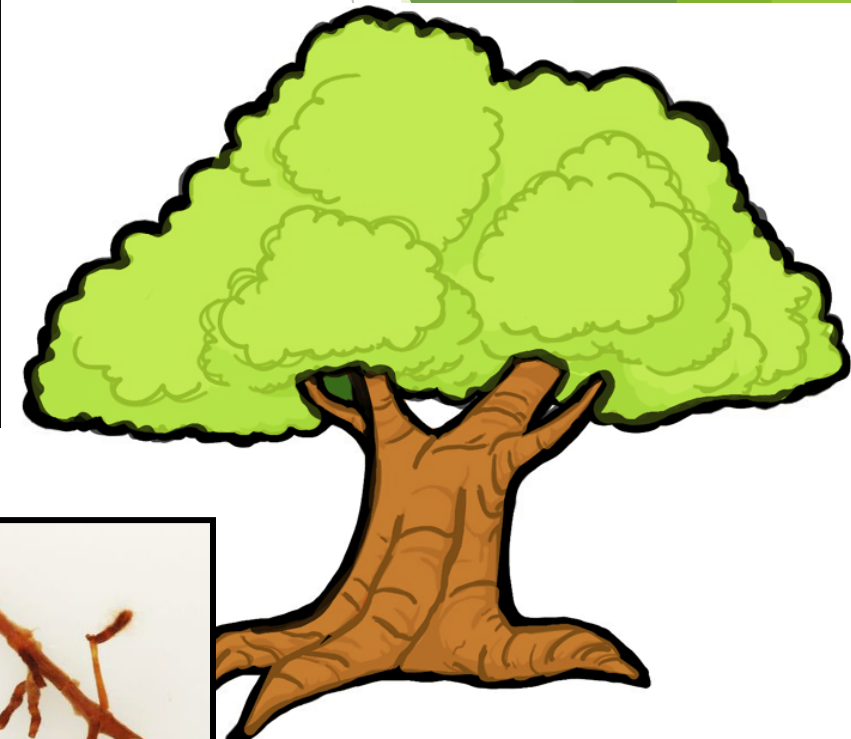
Root infection



Fructification



Mycorrhiza

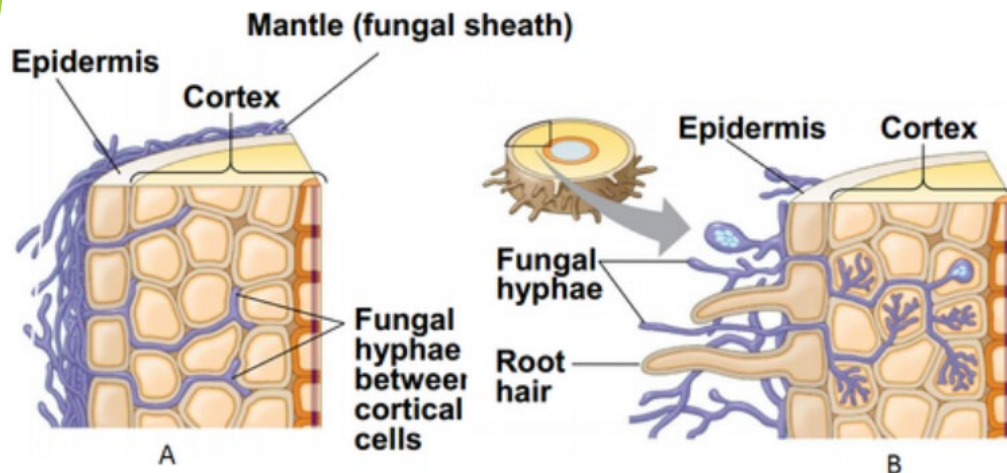


Truffle: A beneficial symbiotic relationship

Benefits of Mycorrhizae

- Produce more vigorous and healthy plants.
- Increase plant establishment and survival at seeding or transplanting.
- Increase yields and crop quality.
- Improve drought tolerance, allowing watering reduction.
- Enhance flowering and fruiting.
- Optimize fertilizers use, especially phosphorus.
- Offer the possibility of cultivating a valuable non-timber product such as truffle.

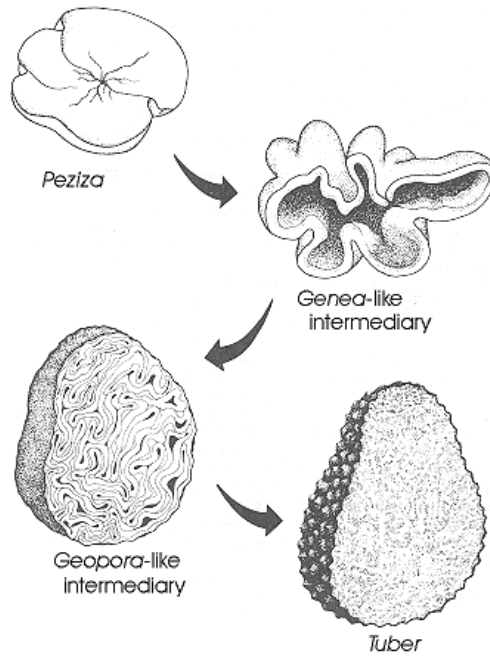
2010, first appalachian
truffle mycorrhiza, Red oak,
18 months old



Evolution



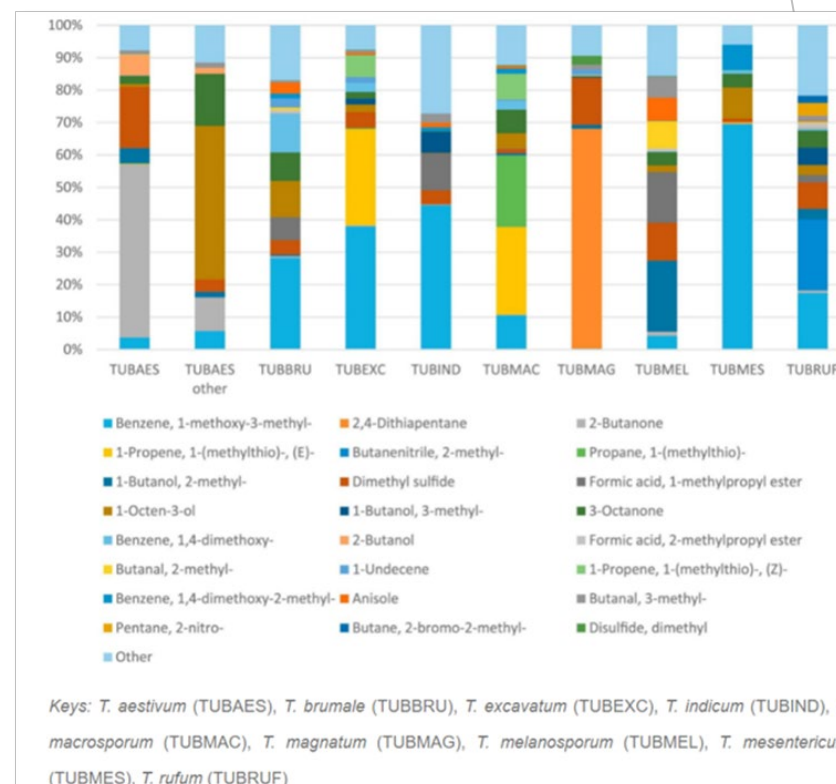
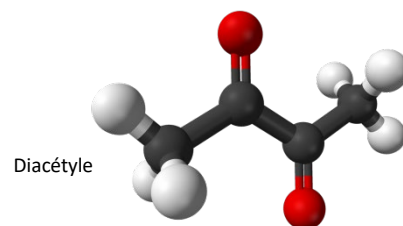
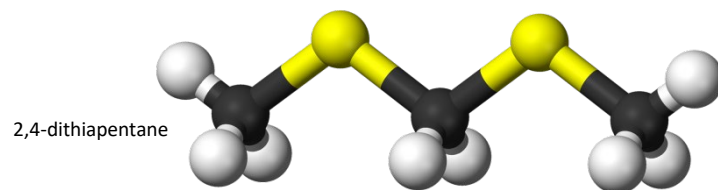
Epigeous



Hypogeous



Evolution and aroma



Real vs False truffle



**Terfezia,
Rhizopogon,
Elaphomyces,
Etc.**

Native truffle species suitable for Ontario:

Appalachian truffle: (*Tuber canaliculatum*) or the Michigan truffle



**First worldwide commercial
harvest by Arborinnov
Exclusive to Ontario truffles
+ Upper Canada Growers**

Origin: America (Canada-
Florida-Mexico)

Size: 2 à 10 cm

Harvest: September-January

Price: 2000 – 3000 \$/kg

First harvest: 8-12 years



Native truffle species suitable for Ontario:

Appalachian truffle: (*Tuber canaliculatum*)

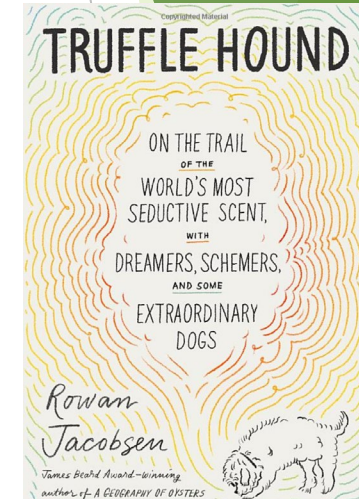


2021:

- The truffle hound, Rowan Jacobsen
- CBS Saturday morning show
- ...

2022:

- Washington post
- Outside magazine
- The Tennessean



Native truffle species suitable for Ontario:

Pecan truffle: *(Tuber lyonii)*



**Excellent native white truffle
in north-eastern america**

Origin: America

Size: 2 à 8 cm

Harvest: September-January

Price: 1200 – 2500 \$/kg

First harvest: 8-12 years



Species of native truffle suitable for Ontario:

Smoky truffle *(Tuber sp.?)*



**Best native white truffle in
north-eastern for cultivation**

Origin: America

Size: 1-5 cm

Harvest: July-october

Price: 1250-1500 \$/kg

First harvest: 4-6 years



European truffle species suitable for Ontario:

Bianchetto truffle: (*Tuber borchii*)



**Fastest and easiest truffle to grow
(lab and field)**

Origin: Europe

Size: 2 à 10 cm

Harvest: late fall-early winter

Price: 1200-2500 \$/kg

First harvest: 5-7 years



European truffle species suitable for Ontario:

Burgundy truffle: (*Tuber uncinatum*)



**Most widely spread truffle:
From Mediterranean sea to
Scandinavia, Spain-Russia**

Origin: Europe

Size: 2 à 10 cm

Harvest: September-January

Price: 1250 – 2500\$/kg

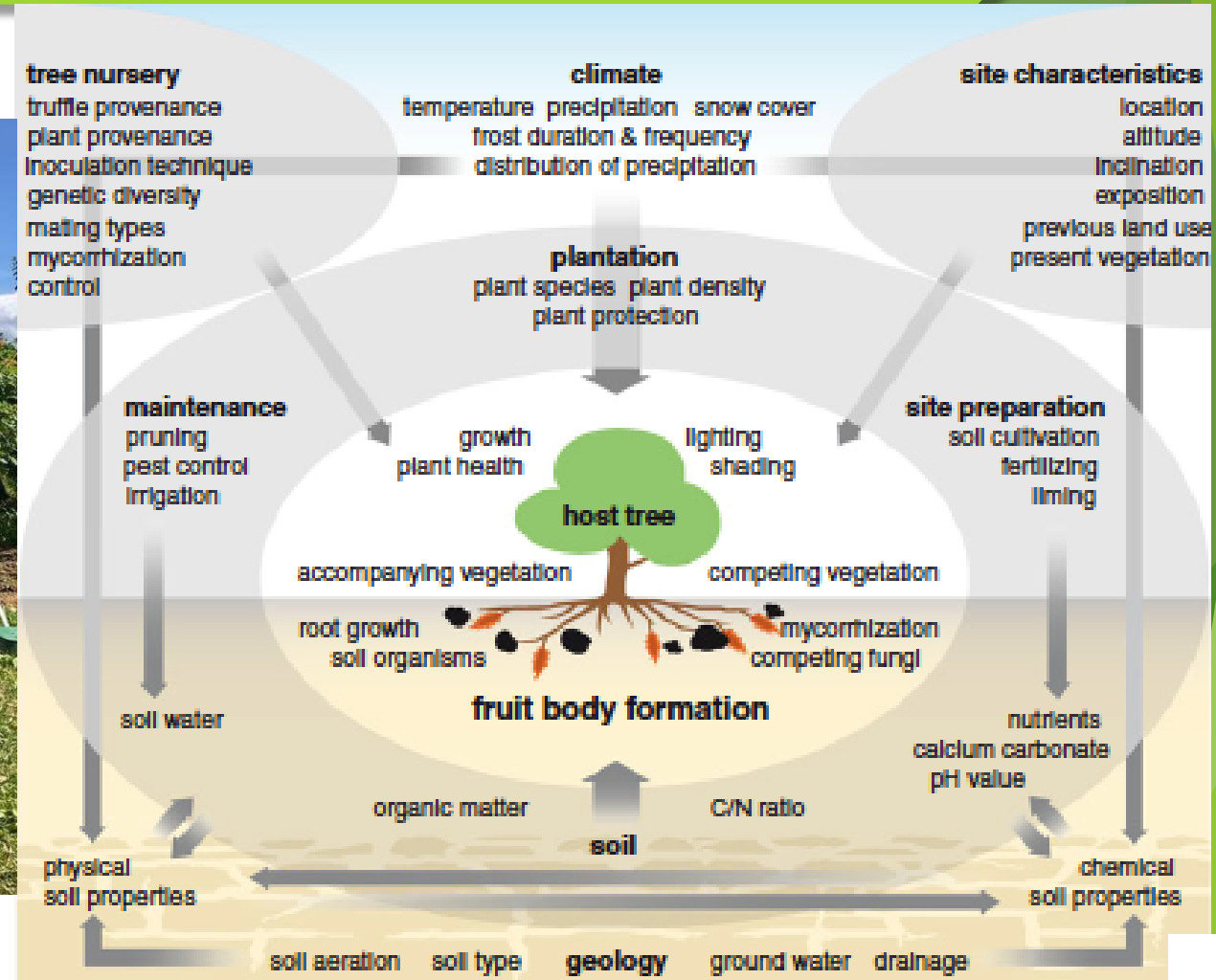
First harvest: 9-14+ years



Trufficulture: truffle cultivation



A truffle orchard (truffière) with American hazelnut



Truffle tree and controlled mycorrhization:

Inoculation par voie sporale

Identification sporale par microscopie et au besoin par identification génétique



Homogénéisation + Fermentation aérobie



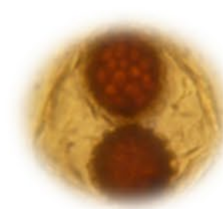
Levée de la dormance des spores



Centrifugation



Spores microbiome de la truffe



Inoculation du transplant dans substrat stérile nutritif



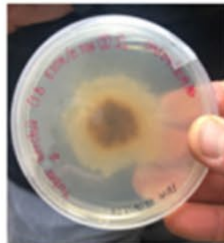
Pasteurisation du substrat de culture



Contrôle de l'inoculum par identification génétique de la mycorhize ou glèbe



Culture mycélienne in vitro et identification génétique*



Micropropagation in vitro



Inoculation des arbres in vitro*



Contrôle Qualité jusqu'à 16-24 mois



Inoculation in vitro



UPPER CANAD,
Growers

Ontario Truffles Inc.

Trufficulture: truffle cultivation

1-Truffle tree settling stage (0-3 years)



Trufficulture: truffle cultivation

2-The burnt (mycelium stage) (3-7 years)



Trufficulture: truffle cultivation

3- The fruiting stage (7 years and +)



Harvest



White truffle (*T. borchii*) on hazelnut tree harvested with Merguez the sausage dog and her master.



White truffle and hazelnut



Harvest

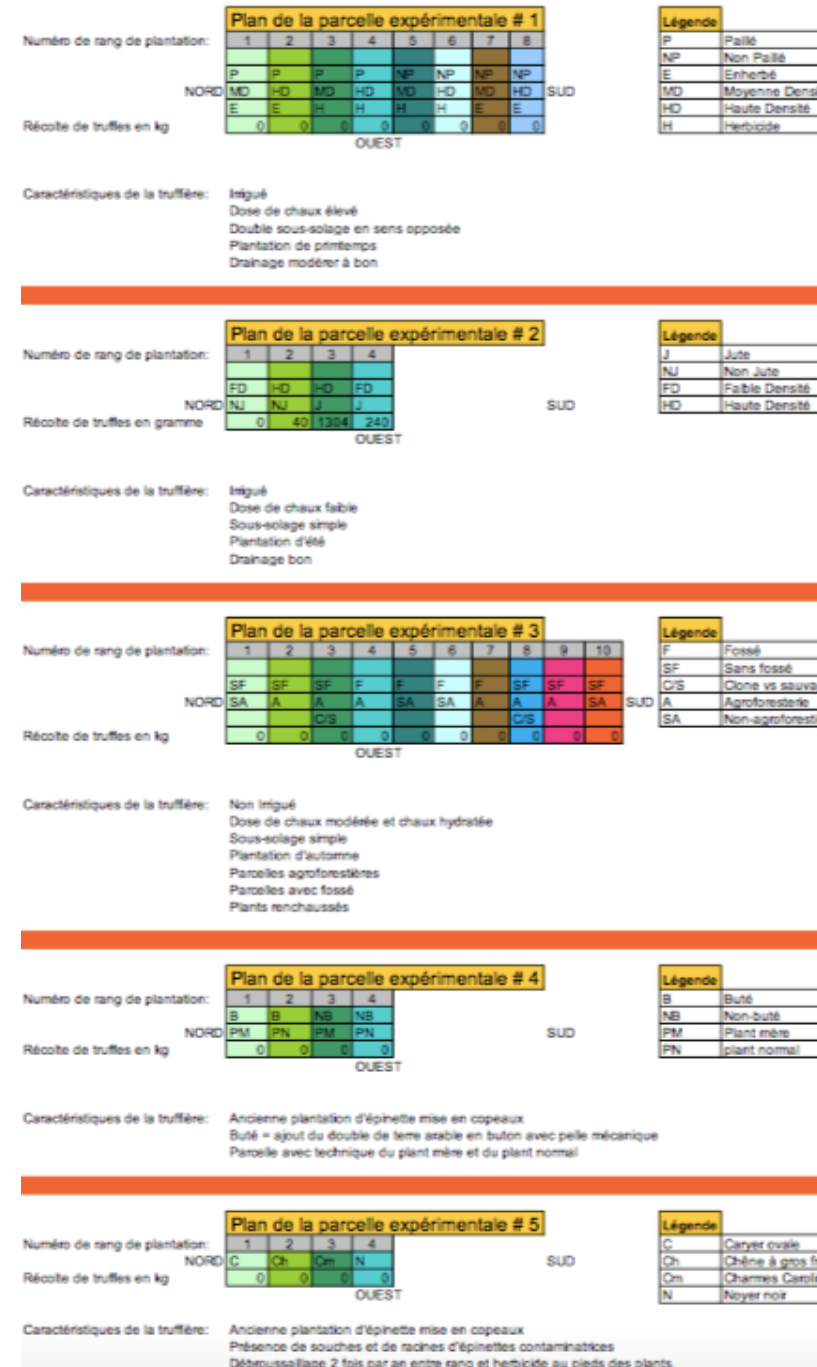
A truffle dog is recommended to make sure to only harvest the ripe truffles.



Experimental truffle orchard

2009-2022

5 experimental truffle orchard in Quebec



Trufficulture and hazelnut

Truffle are harvested under
conventional hazelnut orchard
management.

NUTS *about* TRUFFLES



UPPER CANADA
Growers

ONTARIO TRUFFLES
GROWTH UNDERNEATH



Ontario Truffles Inc.

Trufficulture and hazelnut



Truffle bear fruits in well-managed hazelnut orchards condition, particularly along the edge of herbicide strip and near the interface of a worked soil.

Soil with high active calcium content, good drainage and pH between 7,2-7,5 works best.



Return on investment



POTENTIAL INCOME

Annual yield estimates based on an area of one hectare in Eastern Quebec show a promising return:

Yield projections for a truffle orchard of 1000 plants

6-10 years: 1-5 + Kg/Ha

11-14 years: 5-30 + Kg/Ha

15+ years: 20-60 + Kg/Ha

+ nuts +

Agrotourism, transformed products, land value, etc.

WHOLESALE MARKET PRICE IN CANADA: **\$2000/KG**

For additional information, you may consult

www.ontariotrufflesinc.com, or www.canadatruffleassociation.com

Investment and cost

Spacing 16'X8' 350 trees/acre

or

5mX2,5m 850 tress/hectare

15000-20000\$/acre

-trees

-lime

-fertilizers

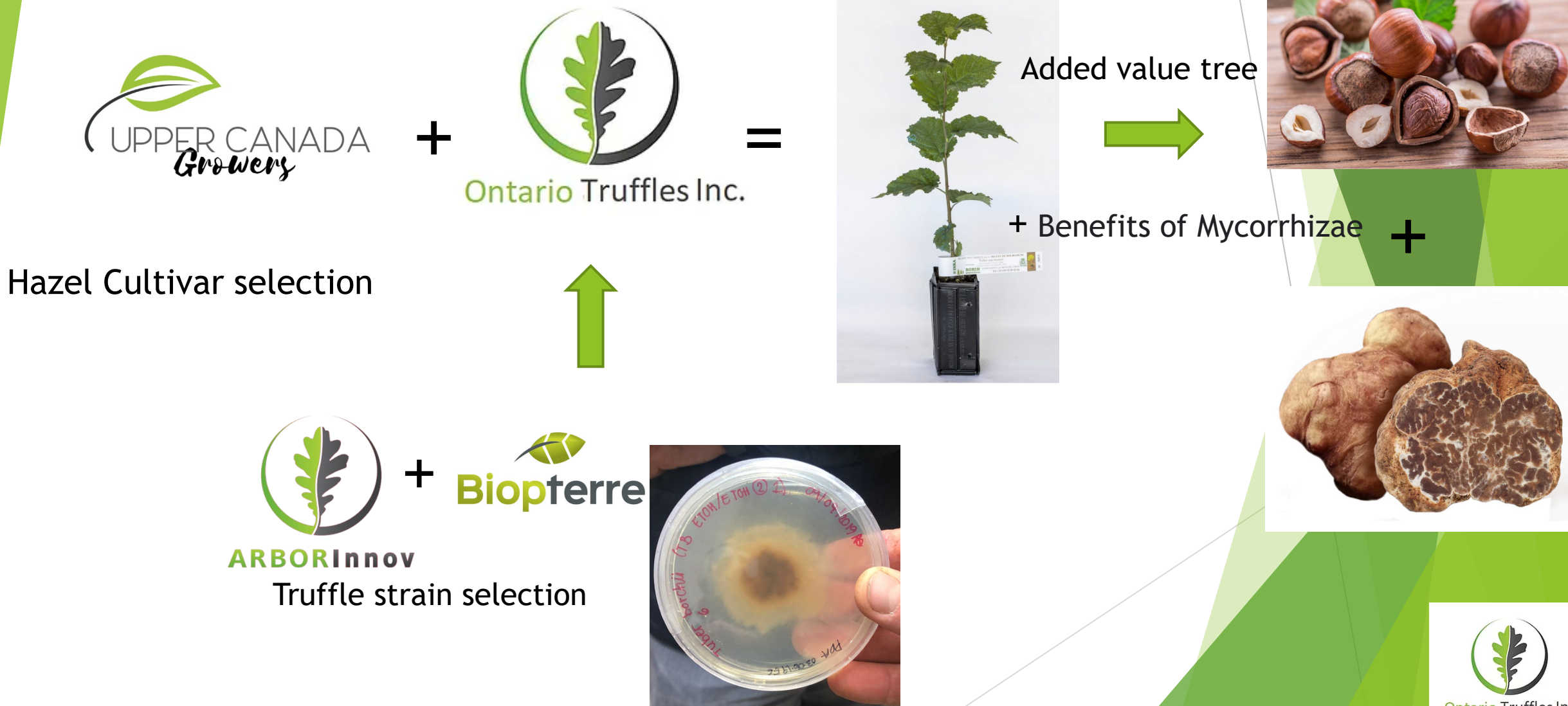
+

Irrigation system



Ontario Truffles Inc.

PARTNERSHIP FOR HIGH POTENTIAL TRUFFLE TREE



Thanks!

- Pr Shannon Berch, UBC
- Pr James Trappe, OSU
- Pr Henri Frochot, INRA
- Pr André Fortin, ULaval
- Pr Yves Piché, ULaval
- Francesca Marzitelli
- Pr Greg Bonito, MSU



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ARBORInnov



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Questions?



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